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TRANSFER OF ENVIRONMENTALLY SOUND TECHNOLOGIES, COOPERATION AND CAPACITY-BUILDING

Report of the Secretary-General

Addendum

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INTRODUCTION

1. The present addendum to the report of the Secretary-General on Transfer of environmentally sound technologies, cooperation and capacity-building (E/CN.17/1996/13) focuses on the assessment of experiences gained, results achieved and problems encountered in implementing specific elements of the work programme on the transfer of environmentally sound technology approved by the Commission on Sustainable Development with a view to identifying key issues for further consideration by the Commission.

2. The addendum is based on information made available by Governments; organizations and bodies of the United Nations system; other intergovernmental organizations; the secretariats of the various international conventions; major groups, particularly business and industry; and financial institutions. The addendum also draws on information and materials provided through inter-sessional meetings.

3. Among the key meetings related to the work programme were the following:

(a) An international conference on environmentally sound technology, (Amman, 11-13 June 1995);

(b) An expert meeting on information systems on environmentally sound technologies (ESTs) (Paris, 9-11 October 1995), organized by the United Nations Environment Programme (UNEP);

(c) A meeting of experts on ESTs for small and medium enterprises (SMEs) (Ottawa, 14-16 November 1995), convened by the Organization of American States (OAS);

(d) An African regional workshop on technology needs assessment in support of the transfer of environmentally sound technologies and international technology cooperation, (Dakar, 17-19 January 1996), co-organized by the African Regional Centre for Technology (ARCT), the Department for Policy Coordination and Sustainable Development of the United Nations Secretariat, and the Economic Commission for Africa (ECA);

(e) An Asia and the Pacific expert group meeting on the transfer of environmentally sound technology among SMEs and Techmart '96 (New Delhi, 22-24 January 1996), organized by the Asian and Pacific Centre for Technology Transfer (APCTT) of the Economic and Social Commission for Asia and the Pacific (ESCAP);

(f) An international expert meeting on the assessment of technological needs for sustainability (Scheveningen, the Netherlands, 5-7 February 1996), co-organized by the Governments of the Netherlands and Switzerland.

I. TECHNOLOGICAL CHANGE FOR SUSTAINABLE DEVELOPMENT

A. Environmental policies and technological change

4. The recognition of the interface between environmental policies and technological change is important in progressing towards sustainable development. 1/ Technological innovations are about to change many of the characteristic traits of the current system of production and consumption (see also the report of the Secretary-General on changing consumption and production patterns (E/CN.17/1996/5 and Add.1). The increased output of goods and services will require the development and use of new and more efficient technologies. In a recent publication of the Organisation for Economic Cooperation and Development (OECD), it was stated that by 2020, OECD countries will increase their annual output of goods and services from US$ 13 trillion to US$ 24 trillion, or by about 2 per cent per year. Developing countries are expected to increase their annual output from US$ 9 trillion to US$ 34 trillion, a nearly fourfold increase, averaging about 4.5 per cent annually in real terms. Only by using technologies that reduce the environmental impact of such growth can future demands be met satisfactorily and sustainably. 2/ One major challenge would be to implement effective environmental policies that would support, the transition to cleaner and more efficient productive systems in the long term.

5. The traditional approach of adopting environmental regulatory regimes complemented by compliance procedures has proven to be inadequate. It tended to promote the application of existing technologies (mostly in the form of end-of-pipe solutions) rather than the development of new ones aimed at pollution prevention and waste minimization in the process of producing goods and services. The development and implementation of new, cleaner technological solutions were, in principle, limited to areas that cause large and acute environmental or health risks (e.g., banning products that contain lead, and phasing out chlorofluorocarbons [CFCs] and polychlorinated biphenyls [PCBs]) 3/.

6. Many Governments are now trying to make the regulatory framework more conducive to private-sector innovations by providing the private sector with greater flexibility in determining how to meet environmental standards. One example of this is the use of regulations that specify the upper limits of waste production but leave it to the discretion of firms how they meet these limits. 4/ The early involvement of the private sector in designing environmental regulations and compliance procedures is being encouraged. Zimbabwe, for example, opens new draft regulations to comments by all interested parties, and also suggests their voluntary compliance for a specific period before making them mandatory. 4/

7. Economic instruments are gaining the attention of policy makers. They are often used in combination with regulatory regimes. This approach has been particularly favoured within the European Union (EU) and by OECD. As reflected, for example, in the new EU eco-management and audit (EEMA), standard which will provide a prestigious award for sites meeting the requirements of the EU for environmental management, evidence of improved performance, and public disclosure of information. 5/ The standard is based on the belief that economic instruments provide a greater inducement to technology development and

diffusion, and moreover tend to stimulate process-integrated technological solutions. They leave economic agents greater flexibility in choosing and adapting their activities in response to changing price signals, and can spur greater technological innovation. 4/

8. The Danish Clean Technology Development Programme provides firms with economic incentives for developing and implementing clean technologies, as well as information incentives and necessary contacts for finding efficient technological solutions to specific environmental problems. 3/ In order to promote the diffusion of biological waste-water treatment plants, the Netherlands increased the effluent charge from Dfl 5.42 in 1973 to Dfl 74.26 in 1991 per unit of population equivalent. This induced many firms to invest in biological effluent treatment systems. 3/ The Government of the Netherlands also uses subsidies in combination with government-sponsored projects for new cleaner technologies, and runs at the same time an accelerated depreciation programme for specific clean technologies. According to Dutch data, there is a good correlation between the level of subsidy and the implementation of cleaner technologies. 2/

9. Private-sector firms have developed and implemented a more sustainable approach to environmental concerns that pays more attention to the fact that productive efficiency has to take into account environmental costs. For example, a number of German companies use the so-called eco-balancing approach (life cycle analysis). Dutch companies are working with suppliers and customers in a product chain management system. 5/

10. Together with regulatory regimes and economic instruments, voluntary approaches are used in the design of policies to promote sustainable development. Such programmes can be self-initiated, such as the Responsible Care Programme undertaken by the chemical industry. Others are built as partnerships between a combination of industry, Governments, and the general public. Examples are the 33/50 Programme in the United States of America or the St. Lawrence Action Plan in Canada. 2/

11. Voluntary approaches can also take the form of contractual agreements between the private sector and governmental authorities to attain environmental goals. 6/ The governmental participation ensures stability of the environmental goals in the area covered by the agreement while it remains in force. The private sector firms that participate in the agreement have flexibility in establishing activities and time-frames for achieving the goals.

12. Voluntary approaches can be an effective means to promote ESTs in support of cleaner production and pollution prevention; they also build confidence and credibility among the private sector, Governments and the public. Public information and awareness of private sector participation and performance under voluntary agreements would be essential to increase accountability for achieving the goals. Since voluntary agreements, so far, mainly involve well-organized business sectors and/or large firms, the question remains open whether they are also workable with small and medium-sized enterprises (SMEs). 2/

B. Relevance of environmental legislation for the promotion of environmentally sound technologies 7/

13. The Institute for New Technologies of the United Nations University (UNU/INTECH) conducted two case studies on how environmental legislation of Governments, if properly implemented, can stimulate the demand of national companies for ESTs. The case studies are based on Mexican and Tanzanian experiences.

14. The findings in the studies underlined that legal requirements and existing capabilities to comply with such requirements have, in principle, a positive impact on companies and entrepreneurs with respect to applying cleaner production methods and demand for ESTs. The main reasons for companies to comply are to avoid future liabilities, ensure competitiveness in the market, and facilitate access to financial sources that impose specific environmental requirements on companies when granting loans or credits.

15. However, since there has been a strong orientation in both countries on the use of regulatory systems, the increased demand for ESTs has primarily focused on end-of-pipe technologies to clean up production effluents. This has created a stronger case for the use of economic incentives. As the costs of clean-up rise, it will eventually become profitable for companies to seek cleaner production technologies and more efficient systems of production. Particularly in Mexico, governmental authorities are using environmental auditing, which allows disclosure of environmental performance by companies.

16. Subsidiaries of transnational companies operating in developing countries are sometimes obligated to invest in ESTs in order to comply with corporate environmental policies and standards. Provided that such investments result in competitive advantages vis-à-vis national companies, they can create an additional impetus for the national companies to also invest in ESTs, even in cases where there is a lack of environmental legislation or where existing environmental laws are not adequately enforced.

C. Technology implications of new concepts linking quality management to environmental management: the ISO 14000 example

17. The International Organization for Standardization (ISO), its member bodies and private industry have embarked on the creation of a set of voluntary Environmental Management System (EMS) standards covering all sectors of industry and private/public enterprise and their relationship with all areas of the environment (land, water, air). These standards, the ISO 14000 Series, contain a managerial "how to" method for improvement of industrial environmental performance. ISO 14000 aims to lay out management procedures and guidelines that will enable companies to more easily meet applicable national and local environmental regulations and standards.

18. The ISO 14000 standards will have the effect of moving companies, particularly exporting ones, to a common set of environmental management principles that will possibly result in increased investment in pollution

control and prevention activities, and the installation of cleaner technologies in plants being built. 8/ The fact that this may help to create a more environmentally conscious industrial culture is just one of several possible advantages these standards may have to offer. Other potential advantages include: (a) better use of raw and waste materials; (b) internalization and accounting of environmental costs; (c) improvement in the amount of emissions produced; (d) lending credibility to environmental standards through its third party auditing system; and (e) acceleration of the transfer and implementation of ESTs worldwide.

II. ACCESS TO AND DISSEMINATION OF INFORMATION ON ENVIRONMENTALLY SOUND TECHNOLOGIES

A. Increasing compatibility and cooperation among information systems and sources related to environmentally sound technologies 9/

19. At the third session of the Commission in April 1995, the United Nations Environment Programme (UNEP) submitted an interim report containing the results of a survey of information systems related to ESTs. The survey was conducted by UNEP in early 1995 in an attempt to identify and characterize the existing and planned information systems related to EST. The Commission welcomed this initial work carried out by UNEP as a practical step for enhancing the cooperation and compatibility between existing and planned information systems and clearing-house functions. The Commission encouraged UNEP to continue its work in this area, in cooperation with other United Nations bodies and relevant organizations, including the United Nations Framework Convention on Climate Change.

20. An expert meeting on information systems on ESTs, hosted by UNEP (Paris, 9-11 October 1995) was part of ongoing UNEP work on EST information systems and a contribution to the fourth session of the Commission in 1996. The focus of the meeting was on analysing existing information systems related to ESTs and exploring the need for a consultative mechanism to improve communication between information providers and users. The main results of the expert meeting are presented below; the full report will be before the Commission as a background document.

1. Assessment of user needs

21. Information requirements of database users vary in relation to the type of users. In principle, there are two groups of users for ESTs: (a) end-users, such as industrialists, land-use planners, infrastructure developers or policy makers in Governments who make decisions about technology imports, and (b) intermediaries, such as international, governmental or non-governmental environmental organizations, university research centres, training institutions, environmental or engineering consultancy firms. Usually, end-users are seeking advice about technology to be installed in an industrial plant, while intermediaries try to find information to advise end-users. End-users have specific needs, which in practice are met by intermediaries.

22. When end-users seek information about potential technological or management improvements, they need to be directed at the earliest stage to the relevant sources of information about appropriate ESTs. A decentralized system of information dissemination with outlets at national and regional level is therefore essential when dealing with inquiries about local environmental and regulatory conditions. Both the end-users and intermediaries need a quick response to their requests for information. Users must feel confident that the data is of guaranteed quality and it has been independently and objectively assessed.

2. Role of intermediaries

23. The function of intermediaries in the exchange of information on ESTs was repeatedly cited as being crucial to successful technology transfer and cooperation, in particular between companies of developed and developing countries. As the first point of contact with the end-user, the intermediary is responsible for passing on relevant information derived from EST information systems that may be located in developed countries. This information may then influence the end-user's choice of technology or know-how. It is therefore important that the intermediary is capable of recognizing and accommodating the end-user's diverse needs.

24. Industries in developing countries are often unsure of even the questions they need to ask in relation to achieving more environmentally sound operations. The intermediary has to analyse those needs, help to form questions, and then seek and provide the industries with information on technological or management issues. The intermediary can also give added value to the raw information from a database by drawing the threads of information together before passing it on as a locally appropriate package to the user. Intermediaries can play a significant role as facilitators of contacts between EST supply companies in developed countries and industry in the developing country, who can then form partnerships and joint ventures.

25. In order to improve awareness of their services, and ultimately awareness of the environmental and economic benefits of ESTs, the intermediary also has a marketing role. To market their services, intermediaries should organize awareness-raising seminars and training courses on the benefits of ESTs. However, fulfilling this role only intermittently would be inadequate. A five-year programme of training and demonstration projects could, for instance, be the most effective means of influencing industry in developing countries, since this would continually attract new audiences, and would reinforce the environmental and economic message being conveyed to existing industry contacts.

3. Information dissemination means

26. The experiences of the different information systems using various information dissemination media (Internet, CD-ROMs, diskettes, printed material etc.) have shown that each can fulfil a particular need and that there is no single media that is superior to others in all instances. Conventional information dissemination methods that were found useful included personal

contact with an intermediary; brochures that give a brief description of a technology; lists of contact names and telephone numbers; newsletters; publications containing demonstration projects and case-studies; and seminars and training courses.

27. Electronic information exchange mechanisms, such as diskettes, magnetic tape, CD-ROM and the Internet, offer very fast access to up-to-date information and are of increasing importance. However, it was anticipated that the more traditional paper-based media would continue to be needed to meet a range of needs. While the Internet is widely available and useful to technology suppliers, users and Governments in developed countries, many developing countries are not yet fully integrated or linked to the Internet, and continue to rely on other information means. In developing countries, an information intermediary might be able to link to the Internet through a local university or research institute.

28. CD-ROMs are often used in universities in developing countries, where the Internet is not yet available. It is easy to use and information can be exchanged in a very attractive format (including images and graphics). CD-ROMs, however, are expensive to produce and are difficult to update.

29. Electronic mail (E-mail) can be useful for networking in developing countries with inadequate access to the Internet. For example, in Latin America, several countries have networked by E-mail on urban environmental issues, and have built up a comprehensive database on waste-disposal sites in the region.

4. Barriers to information access

30. Access to information about ESTs is often difficult both for intermediaries and EST end-users. There are a number of reasons for this, not least the fact that many databases print information in English. A regional or locally based intermediary therefore has an important role as adviser and translator of information into the local languages. In addition, the software required for an electronic database may present problems to the untrained user, and so access to a computer terminal does not always mean access to appropriate data. For the same reason, users of the Internet are also sometimes unable to make the best use of its facilities.

31. The cost of accessing databases is for many information seekers critical. It is essential for information to be available free of charge or at low cost at the initial stage, when an intermediary is seeking to raise awareness of ESTs among potential end-users. When a developing countries' enterprise has gone beyond the initial phase and is actively seeking EST information with a view to making changes to technologies or working practices, the enterprise may be able to pay for such information.

32. A further barrier for SMEs is that they sometimes have very high expectations of a technology's ability to solve unrelated problems, and when their expectations are disappointed they lose faith in making changes of any

sort. This may present a substantial challenge for an intermediary who is encouraging changes in technology or management practices.

B. The need for a consultative mechanism for improving compatibility and cooperation among information systems and sources related to environmentally sound technologies

33. The UNEP effort has identified a significant gap in the ability of technology suppliers, users and intermediaries to know about and to be able to access available information systems and sources related to ESTs. A consultative mechanism established in the form of an EST information system network could help to bridge this gap, and in so doing would have a positive impact on the effectiveness of the dissemination of information on ESTs.

34. The proposed consultative mechanism would take the form of a loosely knit network of institutions that use or supply information on ESTs, and would promote a decentralized approach based on a multiplicity of access points. The meeting suggested that the consultative mechanism would initially be built around three UNEP offices, namely the Industry and Environment Office, the International Environmental Technology Centre and the International Environmental Information System (INFOTERRA) and their collaborative regional and sectoral partners. These offices should also take the lead in carrying out activities in support of a consultative mechanism.

35. The following activities in relation to the proposed consultative mechanism were generally judged to be useful:

(a) Continuation and update of the UNEP survey of information systems on ESTs: following the completion of the current survey, a catalogue of EST-related information systems should be developed and maintained, and be made publicly available in printed form on diskette and/or through the Internet. A periodically updated survey of information systems would be extremely useful for information users in identifying information systems and in the search for appropriate information on ESTs;

(b) User needs assessment: further assessment of the information needs of EST end-users could, among other things, consider ways of improving communication between end-users and information providers. Concerning the information needs of the intermediary, it was felt that more information is needed in respect of the identification of intermediaries, their mode of operation, the type of database they have access to and the means of access (electronic or not), as well as their actual information needs;

(c) Case-studies: conducting a case-study about information intermediaries as well as about developing countries' experiences in the use of existing EST information systems could be helpful;

(d) Networking activities: many EST or research centres or their equivalent networks exist that could provide, in addition to EST information networks, a multiplicity of new access points at the local level. The proposed

consultative mechanism could assist in promoting a collaboration with such centres or networks with a view to supporting cooperation in research and information exchange. Industry and the academic sector could make a positive contribution to the centres, and should be encouraged to participate in the networking;

(e) Benchmarking EST information systems: it would be useful to carry out a benchmark study that would provide, based on an evaluation of existing EST information systems, an outline of best practice in EST information system development and operation. This would allow the preparation of materials on how best to improve system performance and information quality, for dissemination to EST information system operators.

III. CAPACITY-BUILDING FOR MANAGING TECHNOLOGICAL CHANGE

A. Technology centres as facilitators of technology transfer

1. The International Environmental Technology Centre in Japan 10/

36. The International Environmental Technology Centre (IETC) was established by UNEP, with the support of the Government of Japan. The Centre focuses on providing training and consulting services, carrying out research, and accumulating and disseminating related information, with a special emphasis on the environmentally sustainable management of large cities and freshwater lake/reservoir basins.

37. In order to clearly identify the focus of its activities, IETC has undertaken efforts to specify tasks and target groups, as well as to ensure a demand-driven approach for the activities of the Centre. As the main target group for IETC activities, the Centre identified decision makers in local governments and the private sector.

38. Due to the identified needs and demands of the IETC target group, emphasis is given to providing access to EST-related information, as well as to developing pilot programmes for capacity-building for managing technological change. To stress its unique contribution to various UNEP/United Nations Centre for Human Settlements (Habitat) sustainable cities projects, the Centre focused on the management of "soft" technologies, such as environmental risk assessment, environmental technology assessment and technology needs assessment (TNA) as part of the development process. Municipal authorities participating in SCP have increasingly noted the need to apply appropriate "soft" technologies to the planning process of sustainable cities. As a relatively new institution, IETC will continue its identification process by implementing priority activities through demand-driven and results-oriented programmes of work.

39. Some results and products of IETC relevant to information access and dissemination on ESTs include a survey of information systems related to ESTs (in collaboration with UNEP-IE/PAC and the International Environmental Information System (INFOTERRA), as well as the preparation of a number of technical papers, including papers on training needs in environmental technology

assessment; environmental risk assessment for sustainable cities; pilot training programme on environmental technology assessment; and management of Eurasian lakes.

40. In order to foster technology cooperation, IETC has provided soft technology inputs to sustainable city programmes in Shenyang and Wuhan in China, Katowice in Poland and Concepcion in Chile; a survey on technologies to augment freshwater production for urban uses; a source book to better understand technologies available for managing solid wastes in urban areas; and a technology needs assessment report for the management of six lakes in Indonesia.

2. The Asian and Pacific Centre for Technology Transfer in India 11/

41. The Asian and Pacific Centre for Technology Transfer (APCTT) acts as a brokering agent in the transfer of ESTs to SMEs in the Asian and Pacific region. The commissions paid to the Centre for services constitute its major source of income. They are, at the same time, an indicator regarding the usefulness of APCTT in meeting its clients' needs. APCCT's services cover the different phases of the technology transfer process: (a) information and awareness raising; (b) needs assessment; (c) technology sourcing and matchmaking; (d) technology evaluation; (e) market studies; (f) consultancy and advisory services; (g) finance syndication; (h) contract negotiation; and (i) marketing assistance. Fees include a combination of front fees, success fees and royalty arrangements for the technologies it licenses and charges for its services.

42. Provision of information and information networking attract the largest number of clientele. In 1994, APCTT established the International Network for Transfer of Environmentally Sound Technologies (INTET). INTET members, who currently total 100, are mainly innovative SMEs, management consultants and other technology transfer intermediaries. While INTET members receive value-added technology transfer services from the Centre for an annual membership fee of US$ 200, APCTT in turn receives first-hand practical information from SMEs about various problems faced by industries in EST transfer.

43. Recent activities organized by APCTT are good examples of its role in the Asia and Pacific region. In January 1996, it organized an Asia-Pacific expert group meeting on transfer of environmentally sound technologies among SMEs, which was held along with En-Techmart'96. This combination allowed various stakeholders involved in the promotion of SMEs in Asia and the Pacific (entrepreneurs and policy makers, as well as a wide range of support services to SMEs, including information centres, standardization entities, banks, consultancy firms, industrial federation, and bilateral and multilateral organizations) had the opportunity to discuss ways and means to promote the transfer of ESTs to and among SMEs of the region, and to experience technology in action at the same time.

44. During En-Techmart'96, more than 500 pre-arranged bilateral meetings took place between representatives from countries of the Asia and Pacific region, as well as with representatives from European countries and the United States of

America. Each of these meetings resulted from extensive contacts and negotiations, with APCTT acting as a broker in collecting basic information, sourcing technologies and finally matching suppliers and users.

B. National technology needs assessment as a supporting tool for promoting technology transfer and capacity-building

45. At the international level, there is growing interest in sharing the experiences that have been gained by countries and organizations in the use of national technology needs assessment (NTNA) for promoting the transfer of ESTs and capacity-building to develop, use and diffuse ESTs.

46. The Governments of the Netherlands and Switzerland co-organized an international expert meeting on the assessment of technological needs for sustainability with the objective of determining the most favourable conditions and approaches for the planning, execution and implementation of NTNAs and to produce elements for guidelines for NTNAs to be submitted to the Commission at its fourth session for further consideration.

47. The African Regional Centre for Technology (ARCT), the Department for Policy Coordination and Sustainable Development of the United Nations Secretariat and ECA co-organized an African regional workshop on technology needs assessment in support of the transfer of ESTs and international technology cooperation.

48. This workshop focused on the use of sector-specific technology needs assessment as a basis for technology transfer and capacity-building in the conditions that face African countries.

49. Both meetings demonstrated that the technology needs assessment can be an important tool for the identification of actual technology needs and facilitation of donor support in the implementation of priority projects for technology transfer and capacity-building, which emerged from the needs assessment exercise.

1. International expert meeting on the assessment of technological needs for sustainability 12/

50. The main conclusions and recommendations are provided below; the full report of the meeting will be before the Commission in a background paper.

(a) Main conclusions

51. The meeting identified the value added of national technology needs assessments, provided that they are properly followed up by capacity-building actions and technology transfer projects. It found that:

(a) For the national government of the country that carries out the NTNA, it offers a portfolio of capacity-building actions that facilitate, indeed possibly accelerate, the development, adoption and implementation of ESTs;

(b) For the international community and donor agencies, it presents an opportunity to emphasize the demand-driven approach, tailor international technology cooperation, transfer actions to the actual needs of the beneficiaries in target countries, and prepare technology transfer projects that can be undertaken by the private sector and thereby use the potential technology offer and financing capacities of the private sector;

(c) For the different stakeholders in the target country, the NTNA process and its follow-up offers to different stakeholders, such as the private sector, the scientific and research and development communities and non-governmental organizations, an opportunity to enter into a national dialogue on socio-economic and environmental strategies, and to participate in the planning and execution of capacity-building actions regarding the uptake of ESTs.

(b) Main recommendations

52. An NTNA should be considered as a continuous and interactive process, that can logically be organized in three phases:

(a) Creating an enabling environment: setting the stage for an NTNA process by (i) creating favourable conditions, through either awareness raising and communication with stakeholders, and/or execution of pilot projects regarding transfer/acquisition of ESTs; and (ii) defining the NTNA project (problem definition in order to set objectives, define participation of stakeholders, develop the organizational framework and raise necessary funds);

(b) Assessment of capacity-building needs: actual execution of the assessment tasks through data analysis and consultation of national stakeholders, resulting in a portfolio of prioritized capacity-building actions;

(c) Strengthening and developing capacities: implementation of the portfolio of prioritized capacity-building actions. Such capacity-building results in the application of ESTs, the definition and implementation of technology transfer projects regarding ESTs and an ongoing dialogue among national stakeholders, Government and financing institutions regarding the implementation of ESTs. This phase also includes review activities in order to sustain the continuous process of assessing capacity-building needs regarding the application of ESTs and building prioritized capacities.

53. The NTNA process should be transparent. It should also reflect the views of different national stakeholders, as well as their compatibility with national policies, in particular with regard to priority setting between technological options, priority setting among environmental problems and priority setting regarding options for capacity-building.

54. NTNAs should be carried out in three phases: (a) creating an enabling environment; (b) assessing capacity-building needs; and (c) strengthening and creating capacities.

2. African regional workshop on technology needs assessment in support of the transfer of environmentally sound technologies and international technology cooperation 13/

55. The main conclusions and recommendations are provided below. The full report of the meeting will be before the Commission as a background document.

(a) Main conclusions

56. Technology needs assessment is a useful tool for technology recipients and donor countries/organizations, because it can support technology recipients in identifying actual needs in the development of technological capacities, help donors to determine their aid priorities through their involvement in technology needs assessment at the national level, and provide national negotiators of technology agreements, whether in the public or private sector, with the technical basis for asking the right questions and fully understanding the implications of technology agreements.

57. Existing national technology centres or other equivalent mechanisms have an important role to play in developing, monitoring and disseminating existing methodologies and techniques, as well as in providing support for adapting them to specific user needs and conditions. In accomplishing the task of monitoring and disseminating methodologies and techniques, a gradual networking of these national technology centres or equivalent mechanisms is essential. Regional institutions may be an appropriate way to guide the networking process.

58. The usefulness of developing guidelines for undertaking and implementing NTNAs specified to the needs and conditions of countries of the African region was expressed. Such guidelines could include the elements of technology assessment and environmental impact assessment.

(b) Main recommendations

59. There is a critical need for African countries to develop a sound policy framework for scientific and technological development, particularly in relation to the development and transfer of ESTs. The policy framework should recognize the importance of the private sector as an influential force for environmentally sound industrial development in Africa, and appropriate policy measures should encourage private-sector development.

60. Where the market system is not well established, governments should take action to adopt policies and enact laws that encourage private-sector investment and initiatives in technology development and transfer, and that provide overall incentives for the development of private enterprise.

61. Since the private sector is an important source of technological innovation and the main agent of technology diffusion and implementation, aid agencies and recipient countries should involve the business community in policy formulation and programme and project implementation.

62. For markets to work well, better information is required on technology choices and options. In this context, government organizations and donor agencies should provide support to facilitate wider access on the African continent to the Internet and other electronic information systems.

63. In carrying out technology needs assessment, Governments and donor agencies should use national environmental action plans or sustainable development strategies, where these exist, as a basis for identifying sectoral technology needs.

64. All stakeholders in society, business, industry associations, academia, the research community, non-governmental organizations and the civil society at large, should participate in the process that leads to policy formulation and implementation, particularly as it relates to technology needs assessment and technology diffusion.

65. Donor agencies should also assist technology needs assessment in the context of their aid programmes, and should at the same time promote and support South-South cooperation through triangular arrangements for the transfer of appropriate and environmentally sound technologies.

66. African institutes and technology centres should develop closer linkages and better networking capabilities, and should be integrated in an advisory capacity with the procurement decision-making structures of African countries. Technology centres that now exist can serve to coordinate the actions of other national African institutions concerned with technology transfer and related capacity-building activities.

67. Building on existing work, guidelines for technology needs assessment, addressing the conditions of African countries, should be prepared and more widely disseminated. This function could be accomplished by ARCT, in cooperation with other regional institutions, such as ECA, the African Academy of Sciences, the African Centre for Technology Studies and other comparable regional institutions, as well as with the support of international and bilateral organizations, as appropriate.

IV. FINANCING AND PARTNERSHIP ARRANGEMENTS

A. Financing the transfer of environmentally sound technologies to small and medium-sized enterprises

68. It is generally acknowledged that in many developing countries the level of technological change necessary to make tangible progress in sustainable development can only be fully realized with effective financial support and partnership arrangements with donor countries and agencies. As stated by OECD, a special challenge is to enable developing countries to take full advantage of the various cleaner production options, ranging from relatively simple and low-cost process modification to sophisticated and more costly investments in pollution prevention technologies. Technology cooperation and capacity development are therefore important policy tools for assisting developing

countries in their efforts to manage technological change for cleaner production. 14/

69. Particular attention has been given over the last year to the problems of SMEs because they make up the bulk of business ventures around the world. For example, more than 68 per cent of German firms are classified as SMEs. In developing countries, SMEs frequently account for 80 to 90 per cent of all business ventures. The environmental implications and resource demands of SMEs are equally large.

70. In many countries, most untreated industrial pollution originates with the small and medium-sized industrial sector. For the most part, large multinational organizations and financial institutions have not been able to offer the low-cost environmental solutions that such companies need. SMEs typically do not have the capital needed to invest in modern pollution control equipment or cleaner production technologies.

71. In the market for environmentally sound technologies, the private sector has often concentrated its investment efforts and expertise in funding large infrastructure projects, primarily because large projects are easier to manage than investment in a large number of smaller projects. This has in turn deterred smaller entrepreneurs and projects from attempting to acquire funding from private international sources. Although the rate of return is generally better with investments in small and medium-sized ventures, the procedural complications in processing such transactions and the lack of financial instruments designed for this type of transaction makes them economically less attractive for lenders.

72. In an effort to develop solutions to such problems, OAS organized a meeting of experts on environmentally sound technologies for SMEs (Ottawa, 14-16 November 1995). The meeting was held in conjunction with an industry regional round table organized by the Canadian Office for Technology Exchange of Industry Canada. The OAS meeting particularly stressed the importance of SME and micro-enterprises in alleviating poverty and promoting economic development. The meeting was significant not only for the attention given to the issue of transfer of technology at the SME level within the regional context, but also for the significant commitment that OAS made to the implementation of Agenda 21 and other outcomes of the United Nations Conference on Environment and Development on a regional basis.

73. A separate background paper on financing environmental technologies for SMEs is before the Commission. The paper seeks to elaborate the views of financiers on ESTs, identify why they might be reluctant to provide finance for ESTs, and identify ways in which the public sector could encourage an increased supply of finance for the purchase of ESTs by SMEs (see also the report of the Third Expert Group Meeting on Financial Issues of Agenda 21, Manila, 6-8 February 1996; and E/CN.17/1996/7 and Add.1).

74. The paper summarizes the different sources of general finance available for ESTs, and emphasizes the very significant differences between medium, small and micro-businesses in their ability to gain access to finance; it covers both international and domestic sources of finance for SMEs. Internationally, the

most relevant source of direct finance for SMEs is venture capital, mostly for medium-sized business. A sample of over 60 international venture capitalists were surveyed, representing the majority of the international supply of venture capital.

75. The survey found that while there was some interest in environmentally sound technology among international venture capitalists, there was a shortage of information on ESTs from a business perspective. A significant proportion of venture capitalists were sceptical about the relevance of ESTs. There was a high level of interest in receiving possible business transactions from such sources as technology centres, which suggested an area for future action. However, investors were generally concerned about the quality of the transactions that they made rather than the quantity, and put a high level of emphasis on such questions as good business planning and experienced management. Such matters should be addressed before prospective transactions are passed to venture capitalists and government financial support in these areas was thought to be useful.

76. In terms of sources of domestic finance, a country study was made of India, where a number of initiatives to support the financing of ESTs have been established. For smaller businesses, domestic finance will always be more important than international finance, although international capital may be directed through intermediaries. A number of lessons can be drawn from these examples:

(a) Achieving substantial impact requires persistence, and ideally a high level of government support;

(b) A degree of focus in terms of industry and/or region is recommended;

(c) Reducing transaction costs to an acceptable level, for instance through standardizing procedures, is often important;

(d) Outside financial players, while becoming interested in EST-related business, need clearer indications of the potential extent and profitability in financing ESTs;

(e) For some areas, particularly for micro-enterprises, although financing may be viable, support activities, such as advice, may continue to need direct assistance.

77. The paper examines the role of the public sector in helping to improve access to finance for ESTs by SMEs, including both fiscal and financial measures. Fiscal measures, such as tax allowances or tax incentives for "green" investment, can be very effective at "kick-starting" a market, but they are expensive and their use should be carefully controlled. Improvements in the tax system to internalize environmental costs and remove subsidies are very effective in encouraging the use of ESTs, but are subject to political constraints.

78. Financial measures can be more targeted in their application, but can be expensive and bureaucratic. Grants and direct subsidies are flexible and

powerful, but because of their costs should only be used to initialize markets or where other finance is unavailable. Making existing export finance programmes more applicable to the needs of ESTs is a clear way that Governments could contribute to sustainable development and support their own industries. Loan guarantees are effective at encouraging lending to SMEs and could be linked to the acquisition of ESTs. Leasing is a major source of financing for SMEs, and potentially could be very useful in EST financing; thus, supporting the development of leasing initiatives in this area appears sensible. More complex mechanisms, such as performance contracting, are worth supporting, but their success may prove elusive.

79. While official support has made substantial progress in supporting areas such as technology demonstration and partner-finding, there is now both potential and need to involve the financiers of SMEs, and in particular to build linkages between them and EST owners and centres. In doing this, attention should be paid to the needs of financiers, including deal quality and hard financial information.

80. Two models are proposed to encourage financiers to provide capital for SMEs to acquire ESTs. An environmental problem-based model works up from selected environmental problems through the identification of technical solutions to the involvement of financiers in developing financial solutions. The objective is the development of lines of business that are attractive to financiers. Public-sector support is involved in funding feasibility and start-up costs, identifying partners, and providing potentially ongoing support through risk-sharing. A summary of relevant financing mechanisms is contained in the paper.

81. The alternative approach is a macrolevel approach that aims to involve financiers on a wider scale, through the dissemination of information on ESTs and the establishment of linkages between financiers and technology centres. As a next step, the provision of concessional finance to provide funds for packaging individual deals and projects at the level of quality expected by financiers offers the potential of achieving a very high level of leverage and accelerating the uptake of ESTs.

82. These models, taken in conjunction with the continued development of a supportive business framework for SMEs and adequate incentives to improve environmental performance, have the potential to greatly improve the access and use of ESTs by SMEs.

B. The Climate Technology Initiative of the Organisation for Economic Cooperation and Development/International Energy Agency 15/

83. OECD/IEA member countries have launched the Climate Technology Initiative (CTI) as a linked set of national and international measures to accelerate the development, application and diffusion of cost-effective, environmentally sound production and end-use technologies, including practices and processes, by (a) enhancing markets for and reducing barriers to available, new and improved technologies that have the potential to help reduce greenhouse gas emissions, and (b) encouraging research into and development and deployment of medium- to

long-term technologies that have the potential for far-reaching reductions of greenhouse gas emissions.

84. CTI is aimed at strengthening current efforts to use commercially available technologies, enhancing efforts to develop new and improved technologies and improving the potential for their widespread use. All countries interested in participating in these activities will be welcomed. Attention is focused on energy technologies and energy-using processes, as well as other innovative technologies that could over time be developed and, as appropriate, adapted for reducing greenhouse gas emissions and enhancing carbon sinks.

85. CTI has identified seven programme areas for action at the national and international levels. Two programme areas of CTI that seem to open possibilities for interaction in the course of the further implementation of the work programme on the transfer of environmentally sound technology and of CTI are "Facilitating the use of voluntary activities" (in the context of discussing environmental policies and technological change and "National action plans: technology aspects" (in the context of dealing with national technology needs assessment); the two programme areas are described in detail below.

1. CTI programme area: "Facilitating the use of voluntary activities"

86. Many OECD/IEA countries have developed programmes in which the private and public sector have voluntarily agreed to make profitable/cost-effective investments in technologies or processes that reduce greenhouse gases. Examples of such programmes are: in the United States of America, "Green lights", "Energy star computers", "Climate change", "Motor challenge", "Ag star" and others; in the Netherlands, "Covenants with industry"; in New Zealand, "Energy-wise campaign"; in Germany: "Powerklauer - power thief"; in Australia, "Greenhouse challenge"; and in Japan, "Voluntary plan concerning environment".

87. The adoption of voluntary programmes will be advanced primarily by sharing information between all groups involved in such programmes. This will be carried out through cooperation in such activities as programme design and facilitation workshops, bilateral initiatives, and multilateral discussions in such bodies as UNEP, OECD, IEA and other international organizations.

88. An OECD/IEA international workshop on the theme "Voluntary approaches for mitigating energy-related CO2 emissions" (Bonn, 30 and 31 October 1995) discussed, inter alia, experience with the development and application of voluntary programmes (including the pros and cons of such approaches), as well as actions and options for further developing voluntary measures and programmes in OECD member countries and in other countries. The Workshop identified areas where follow-up activities could help to extend the use of voluntary measures to developing countries and countries with economies in transition. Specific attention is focused on the involvement of industry and other intergovernmental and nongovernmental agencies in these processes and in the application of voluntary measures.

89. A similar initiative was a conference on the theme "Sustainable industrial development: sharing responsibility in a competitive world" (Amsterdam, the Netherlands, 22 and 23 February 1996). Based on the premise that industrial sustainable development requires collaboration between Governments and industry, the conference provided an important platform on which key decision makers from Governments and industry could examine new trends in environmental policy. In addressing the shared objectives of industrial sustainable development, the participants had the opportunity to explore the impact that these new trends would have on the relations between Governments and industry at the national and international levels. 16/

2. CTI programme area: "National action plans: technology aspects"

90. This CTI programme area will be structured around coordinated action by developed countries to assist other countries, upon request, in developing in an integrated way the technology aspects of their national climate change action plans. Such activity would contribute appropriate technical assistance for conducting technology needs assessment in order to identify technological opportunities and options within the host country as part of its climate change response strategy. Options would focus on currently available technologies and their enhanced application in any interested country.

91. It is planned to undertake a broad analysis conducted by the United States of America, France, Switzerland and the Netherlands, with assistance from the OECD/IEA secretariats, including communication with the OECD Development Assistance Committee. Its objective would be to identify the need for coordinating assistance programmes, and help to identify gaps in the development of technology aspects of national plans. The results of such an analysis will help guide the choice of follow-up actions so as to strengthen the technology focus of national action plans.

Notes

1/ The following international meetings and recent publications, among others, have discussed this topic: an OECD workshop on development assistance and technology cooperation for cleaner industrial production in developing countries (Hanover, Germany, 28-30 September 1994); a UNEP high-level advisory seminar (Warsaw, 12-14 October 1994); a conference on the theme "Environment: the new business challenge" (Torino, Italy, 2 December 1995); OECD, Technologies for Cleaner Production and Products: Towards Technological Transformation for Sustainable Development (Paris, 1995); "Technology and environment", in OECD, The Life Cycle Approach: An Overview of Product/Process Analysis (Paris, 1995).

2/ See OECD, Technologies for Cleaner Production: Towards Technological Transformation for Sustainable Development (Paris, 1995).

3/ See Rene Kemp, "Technological impact of environmental policies: a review of past experiences and policy guide for the future", paper for a

conference on the theme "Environment: the new business challenge" (Torino, Italy, 2 December 1995).

4/ See OECD, "Promoting cleaner production in developing countries; the role of development cooperation" (Paris, 1995).

5/ See Peter James, "The changing nature of European environmental management: the role of top environmental executives", paper presented to the conference on the theme "Environment: the new business challenge" (Torino, 2 December 1995).

6/ According to OECD, so far about half of its member countries have concluded voluntary agreements, including Australia, Canada, Finland, France, Germany, Italy, Japan, the Netherlands, Switzerland, the United Kingdom of Great Britain and Northern Ireland, and the United States of America.

7/ Section I.B. is based on the following papers, which were submitted by the United Nations University Institute for New Technologies (UNU/INTECH) to the Commission at its fourth session: summary of a report entitled "Relevance of environmental legislation for the transfer of environmentally sound technology: the Mexican experience" (June 1994-February 1995); summary of a report entitled "Relevance of environmental legislation for the transfer of environmentally sound technology: the Tanzanian experience" (July 1995-January 1996).

8/ "Private sector investment flows and the environment: defining the opportunities and issues", Background Paper for the UNEP Round-Table on Investing in the Environment. 30 to 31 October 1995, Yale Center for Environmental Law and Policy.

9/ Section II.A. is based on the report of an expert meeting on information systems (Paris, 9-11 October 1995).

10/ Section III.A.1. is based on information provided by IETC to the Commission at its fourth session.

11/ Section III.A.2. draws on information provided by APCTT of ESCAP.

12/ Section III.B.1. is based on the conclusion and recommendations adopted at an international expert meeting on the assessment of technological needs for sustainability (Scheveningen, the Netherlands, 5-7 February 1996).

13/ Section III.B.2. is based on the report of an African regional workshop on technology needs assessment in support of the transfer of ESTs and international technology cooperation (Dakar, 17-19 January 1996).

14/ See "Future work in technology cooperation and capacity development", in report of OECD/DAC Working Party on Development Assistance and Environment on its thirteenth session (Paris, October 1995).

15/ Section IV.B. is based on information provided by the IEA secretariat in Paris.

16/ See "Sustainable industrial development: sharing responsibilities in a competitive world", conference paper prepared by Arthur D. Little for the Ministry of Housing, Spatial Planning and the Environment and the Dutch Ministry for Economic Affairs of the Netherlands (February 1996).